Science, Technology & Innovation for Defence & Security

Dr. Marc Fortin
Assistant Deputy Minister (Science & Technology)
Department of National Defence
June 2017

The context of defence and security is evolving….

Evolution of Warfare	Science Context is Evolving
New threats come from new and unpredictable adversaries (e.g. ISIL), hybrid warfare, global terrorism, etc…	**FROM:** Science & Technology has shifted from work led by defence labs (e.g. jet engine, Internet, GPS)
Shifting balance of power: new players, new domains, influence of non-state actors, unstable and failing states, …	**TO:** New technological developments (e.g. quantum, synthetic biology, artificial intelligence, etc…) are not driven by government.
Information is an ever more important domain that supports the conduct of other types of warfare.	**Innovation** is more distributed in more organizations than before and is often led by the commercial sector.
The ability to make sense of data and process it into information is key.	Federal labs now conduct less than 8% of the research in Canada

What does it mean for DND?

We need to….

- **Recruit innovators** to be partners in the delivery of S&T in support of defence and security;
- Use partnerships and collaboration to foster and **leverage emerging S&T** developed across the innovation ecosystem;
- Develop a technologically advanced and **innovation-driven defence and security sector** capable of addressing evolving threats; and
- Develop deeper linkages with **like-minded countries**

Canada's New Defence Policy makes significant investments in innovation

Innovation is fundamental to providing Canada with future defence and security capabilities as emerging technologies and players change the nature of conflicts and threats.

- The policy commits to investing $1.6 billion in innovation over 20 years.
- DND to launch the Innovation for Defence Excellence and Security (IDEaS) program with this investment, to be led by ADM(S&T).
- The IDEaS program will accelerate and stimulate science and technology by capitalizing on a broader range of experts and innovators enabling us to provide DND, the CAF and security organizations with the best possible S&T solutions and advice.

The IDEaS program will create new innovation support tools

Recruiting innovators

- Engage academia, industry, scientists, entrepreneurs in **ideation** to generate new concepts to challenging defence and security problems.
- Create **competitions and challenges** around key defence and security problems in order to access innovation and stimulate breakthroughs.

Supporting innovative ideas

- Support **projects** that will allow for short term development of promising ideas.
- Create "**innovation networks**" to build a critical mass of S&T expertise across academia, industry and government.

Accelerating deployment of ideas into products

- Provide support through **technology maturation** and transition.
- Provide **"sandboxes"** to assess new technologies.
- Allow **procurement** for trials.
- Bring innovations into the hands of **operators**.

ASSISTANT DEPUTY MINISTER (SCIENCE &TECHNOLOGY) / SOUS-MINISTRE ADJOINT (SCIENCE & TECHNOLOGIE)

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The ability to make sense of data and process it into information is key.	Federal labs now conduct less than 8% of the research in Canada

But our mission remains the same…

Provide DND and the CAF with an advantage in knowledge, technologies and solutions for mission success

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Recent initiatives are accelerating innovation

Support to industry

- Over 100 projects submitted by industry for up to $80M of funding over 3 years (ADSA)
- Increased investment by companies (50:50) with 8 new DIRP projects (up to $8M)

Recruiting ideas

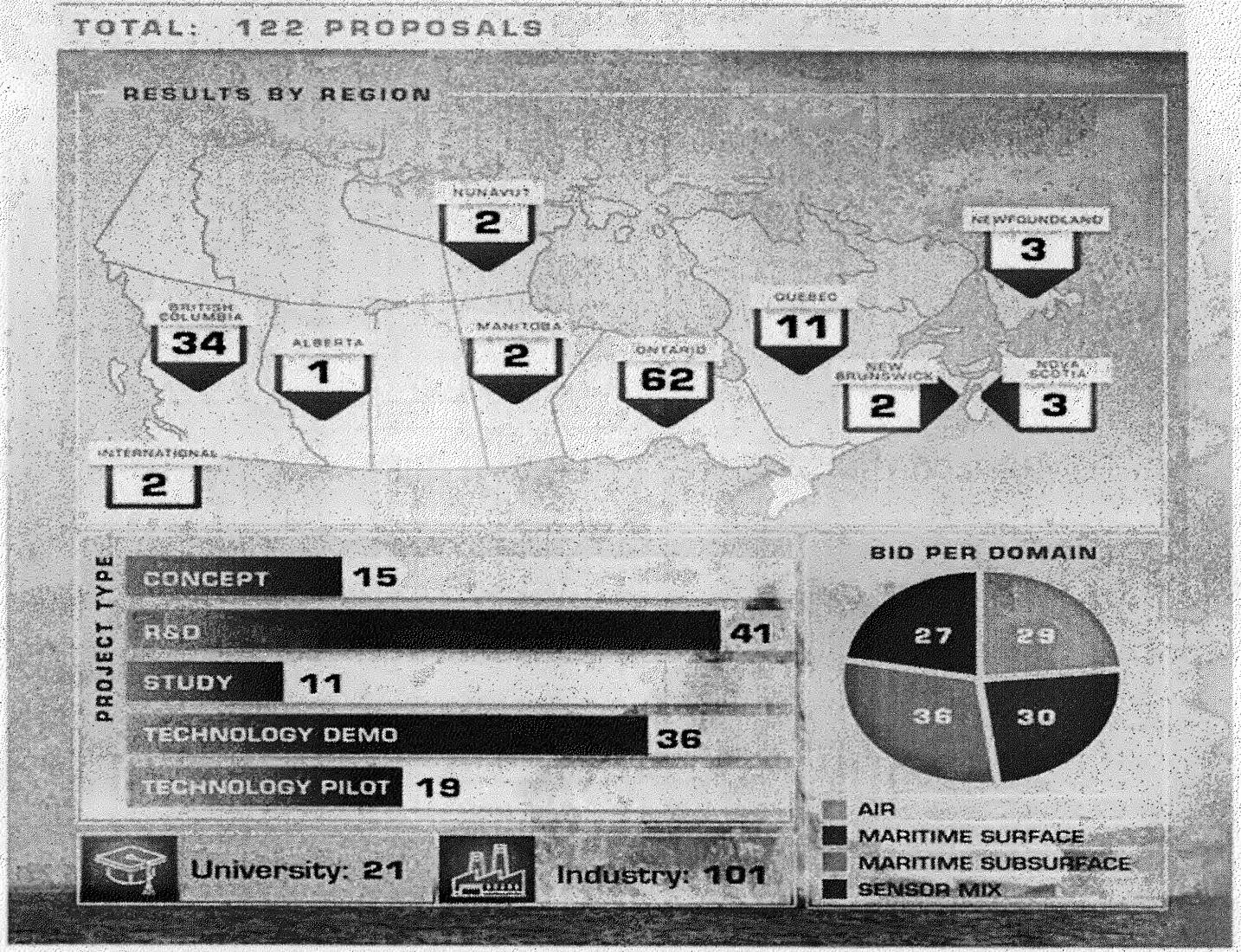
- 89 academics provided ideas for human performance in February
- Approx 140 academics applied for funding (less than $5M)

Demand-driven projects

- 41 universities are part of CIMVHR (up to $10M)
- Up to $20M is provided to networks with the CSSP program – over 50 current networks

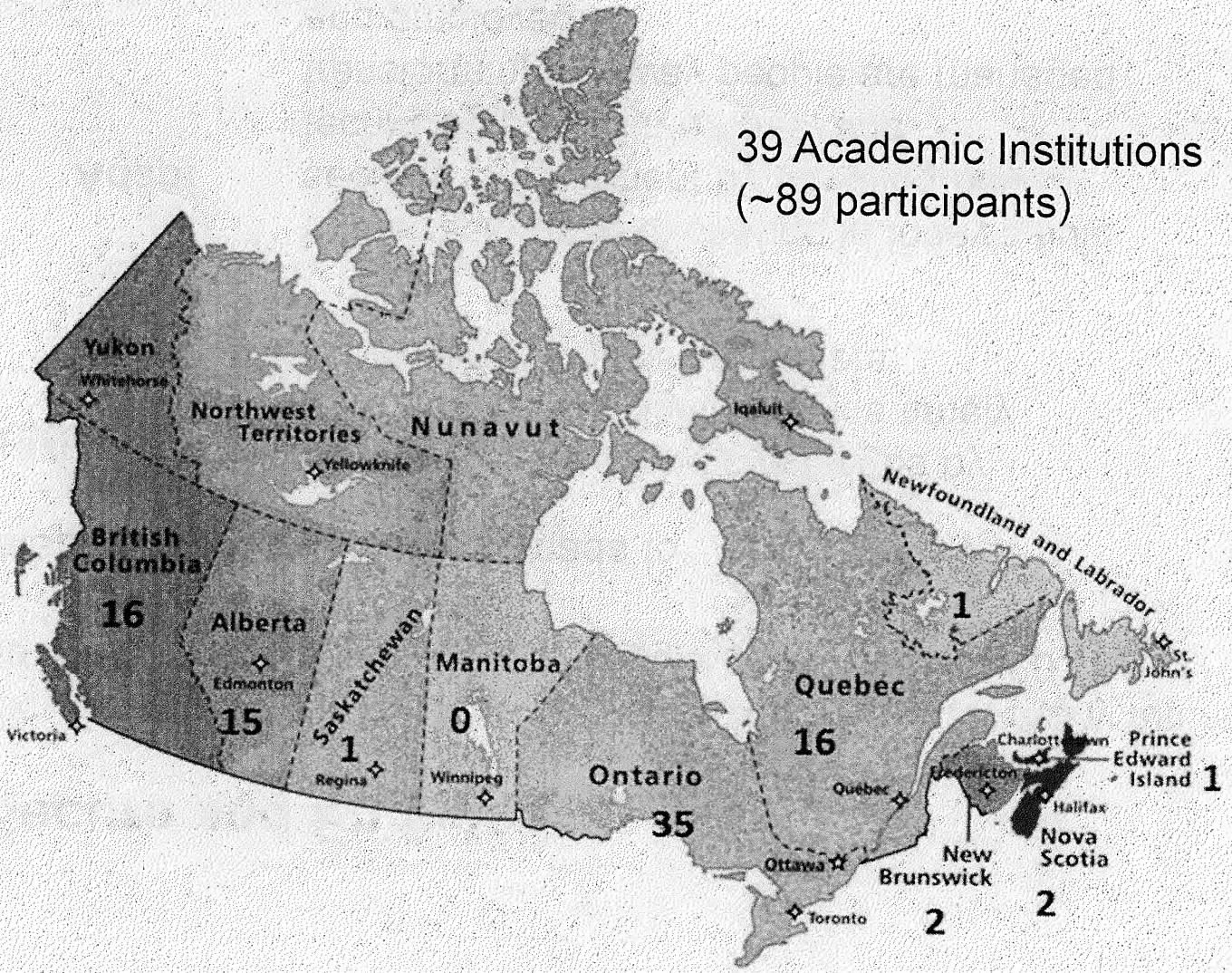
Innovation Call for Proposal ADSA S&T Program

SOLICITATION RESULTS



Human Systems Performance

39 Academic Institutions
(~89 participants)



Strong, Secure and Engaged

This new policy provides clear direction and is the foundation for many future decisions and investments in defence and security over the next 20 years.

The New Defence Policy will enable Canada to:

Anticipate emerging threats and challenges by improving our ability to provide timely information to decision makers.

Adapt to the rapid pace of change in today's fluid security environment by adopting new technologies and methods, and transforming the way people are managed and employed.

Act decisively with effective military capability by making long-term investments in the CAF.

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Innovation for Defence and Security (IDeS)

Dr. Marc Fortin
Assistant Deputy Minister (Science & Technology)
Department of National Defence
10 March 2017

Global Security Environment: New Challenges

- **New threats**: New and unpredictable adversaries (e.g. ISIL), hybrid warfare, global terrorism, etc.
- **Shifting balance of power**: new players, new domains, influence of non-state actors, unstable and failing states, etc.
- **Rapid evolution of technology**: shift from innovation led by defence labs (e.g. jet engine, Internet, GPS) to innovation led by commercial sector (e.g. smart phones, robotics, advanced materials). Globalization of S&T and pace of technological development (e.g. quantum, synthetic biology, artificial intelligence, etc.) creates vulnerabilities and opportunities.

ACCESS

Technology and innovation is now originating outside government. Government needs to access these ideas at their inception to stay ahead.

Defence Innovation Trends of Key Allies

- The **U.S.** has launched its *Third Offset Strategy* (U.S. $3.6 billion) aimed at leapfrogging the conventional R&D process by tapping into civilian efforts and improving collaboration with innovative private sector enterprises. The US DoD has requested a budget of US$71.8 billion for R&D in 2017.

- **Australia** has launched the *Next Generation Technologies Fund* ($730 million over 10 years) and a *Defence Innovation Hub* ($640 million over 10 years) to undertake collaborative innovation activities from initial idea, through testing to application.

- The **United Kingdom** in support of Innovate UK, launched the *Defence Innovation Initiative* (£800m over 10 years).

Lessons Learned from Allies

- Fast contracting times are necessary to keep pace with the Innovation ecosystem (in days and weeks, not months).
- Open calls for innovation generate new solutions.
- Support to innovators, both funding and expertise support, is essential for success.
- Mechanisms need to be in place to attract subject matter experts (SMEs) where most innovation takes place (e.g. 100% funding for lower TRLs, ease of requesting funding, fast contracting times since average lifespan of a start-up is one year).

Innovation for Defence & Security (IDeS) - program drivers

Expected outcomes:

- **Short term: D**ND has an effective mechanism to seek innovative solutions to solve defence and security challenges
- **Medium term:** Canadian SMEs are increasingly engaged in solving defence and security and problems
- **Long term:** Innovation provides better CAF capabilities as well as a technological advantage.

Key features:

- Simple, coherent and agile processes
- Demand driven: Competitions and projects are driven by the challenges identified by DND and security partners
- Bring new products into the hands of defence and security
- Policy in place to move quickly from prototype to fielding solutions

Three levels of interventions for the IDeS initiative

Recruiting innovators

- engage academia, industry, scientists, entrepreneurs, … in **ideation** labs to generate new concepts or processes
- create **competitions and challenges** around key defence and security problems in order to access innovation and stimulate breakthroughs

Supporting innovative ideas

- support **projects** that will allow for short term development of promising ideas
- create "**innovation networks**" to build a critical mass of S&T expertise across academia, industry and government
- **catalyze** and support the incorporation of defence and security objectives into other federal programs

Accelerating deployment of ideas into products

- support people (and ideas) **mobility** between organizations to accelerate tapping into new knowledge and expertise
- **share R&D risks** where appropriate to bring innovations to market
- provide support to make projects "**procurement ready**"
- provide **"sandboxes"** to support Canadian entrepreneurs
- allow for limited procurement (**try and buy**)

Recent initiatives that aim at accelerating innovation

Support to industry

- Over 100 projects submitted by industry for up to $80M of funding over 3 years (ADSA)
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Recruiting ideas

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Demand-driven projects

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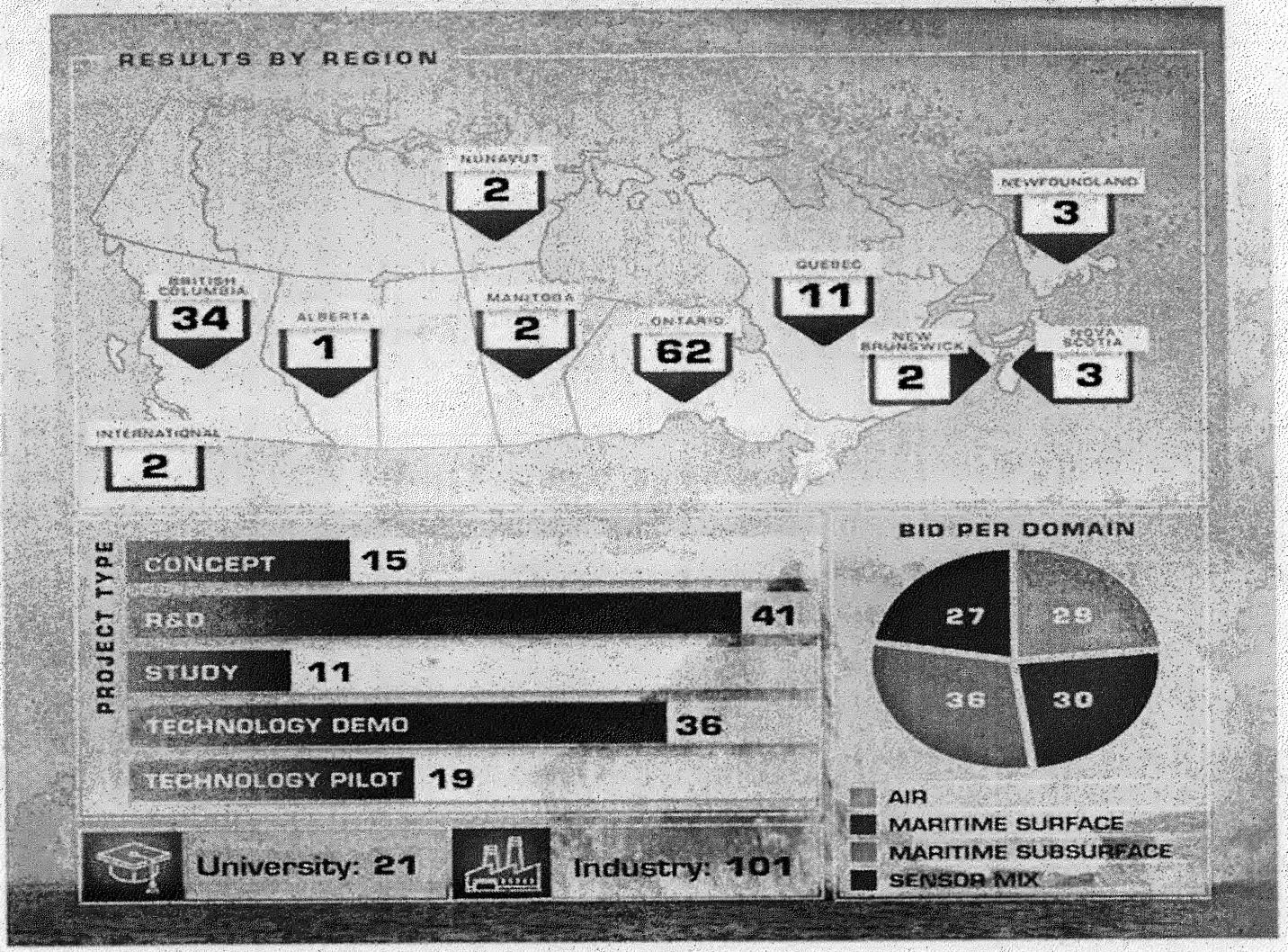
Innovation Call for Proposal ADSA S&T Program

SOLICITATION RESULTS

TOTAL: 122 PROPOSALS



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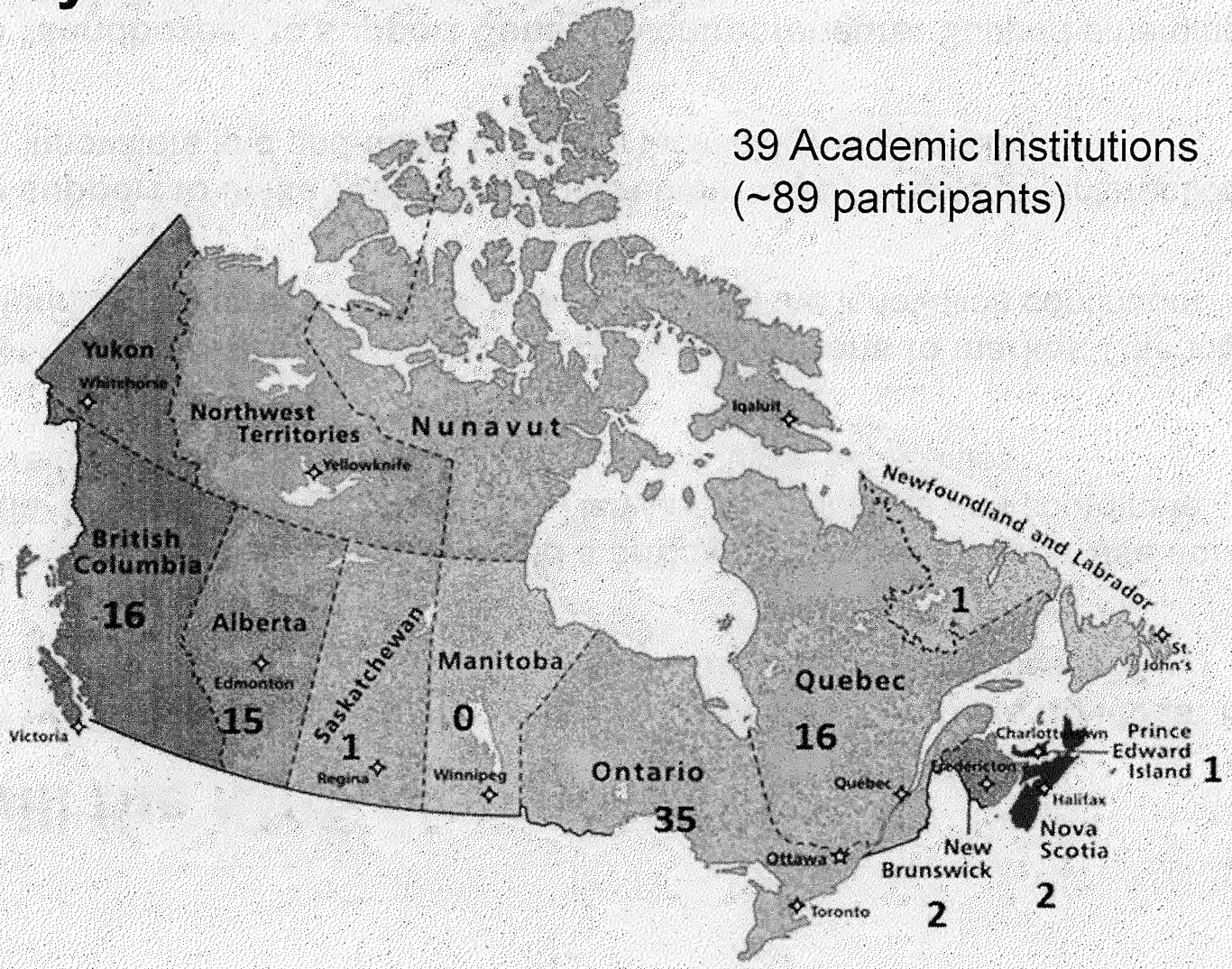

How will the IDeS elements work?

- **Support projects to allow for short term development of promising ideas:** Fund ideas for up to 6 months - 2 years (allowing for "fast fails" where necessary).

- **Create "Innovation Networks" to build a critical mass of S&T expertise across academia, industry and government:** Networks will mobilize and coordinate innovators to address S&T challenges to address future capabilities

- **Share R&D risks where appropriate to bring innovations to market:** Offering a suite of funding instruments to provide support along the innovation continuum.

- **Provide support to make projects "procurement ready":** catalyze interactions between innovators and end-users to enable technology exploitation.

- **Provide "sandboxes" to support Canadian entrepreneurs:** Support emerging solutions through sandbox trials, where innovators can test their technologies.

- **Allow for procurement (try and buy):** For rapid integration of new technologies or processes through support of early procurement.

Transition to IDeS

- Previous programs to be transitioned:
  - Technology Demonstration Project (TDP) – app. $10-20M/year
  - Technology Innovation Fund (TIF) – app. $6-7M
    (no resource allocation in 2016-17)
- Programs to be leveraged :
  - Canadian Safety and Security Program (CSSP)
  - Defence Innovation Research Program (DIRP)
  - All Domain Situational Awareness (ADSA)

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Potential Roll-Out of Innovation-Related Initiatives

Q2

- Funding announcements (contracts) for the Defence Innovation Research Program for : a) Space-based technologies for surveillance b) All Domain Situational Awareness contracts (
- Launch of a call for proposals for the Defence Innovation Research Program for : Space-based technologies for surveillance; Naval Mine Hunting; Human Performance

Q3

- Defence innovation (DPR related, *ad reference* to GoC decisions)
- Launch of a call for proposals for the Defence Innovation Research Program for : Power and Energy for military applications; Space-based technologies for surveillance

Q4

- Launch of call for proposals for the CSSP program, up to $20M
- Launch of several Defence innovation (DPR related, *ad reference* to GoC decisions) initiatives.

Science, technology and innovation for defence and security

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Department of National Defence
March 2017

ADM S&T mission:

Provide DND and the CAF with a knowledge and technology advantage for mission success

Outcomes:

- A safe and secure Canada
- Safe and secure Canadians

The conduct of warfare is evolving

- **New threats** come from new and unpredictable adversaries (e.g. ISIL), hybrid warfare, global terrorism, etc…

- **Shifting balance of power**: new players, new domains, influence of non-state actors, unstable and failing states, …

Information

is an ever more important domain

that supports the conduct of other types warfare

The ability to make sense of data and process it into information is key.

And science and technology is more distributed…

From

Science and Technology

leading to innovation has shifted shift from work led by defence labs (e.g. jet engine, Internet, GPS)

To

Innovation

uses S&T to create new services (eg algorithms) and is led by the commercial sector

… and new technological developments (e.g. quantum, synthetic biology, artificial intelligence, etc…) are not driven by government.

Federal labs now conduct less than 8% of the research in Canada

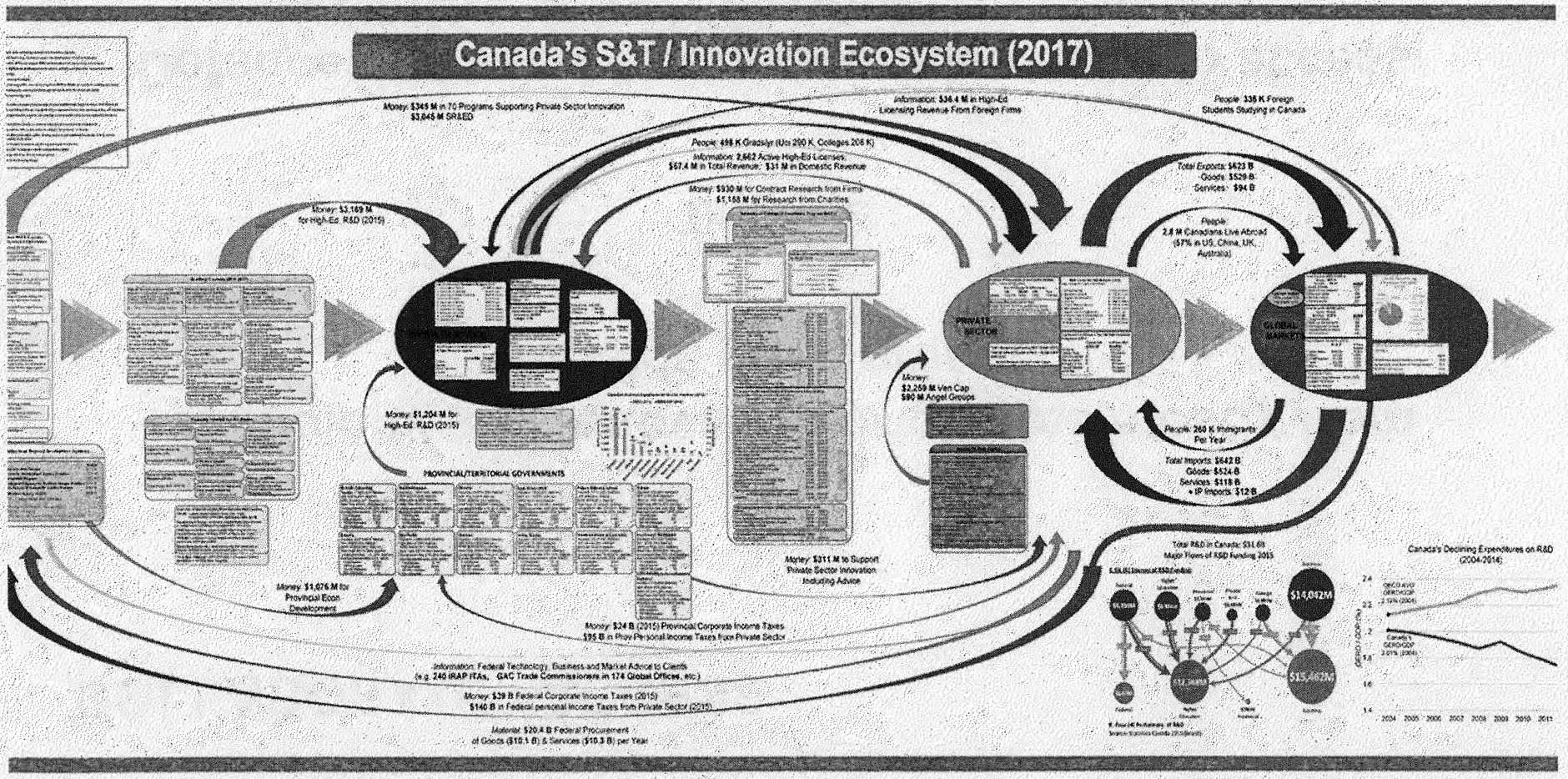
COLLABORATE / ACCESS

Technology and innovation originates mostly from outside government.

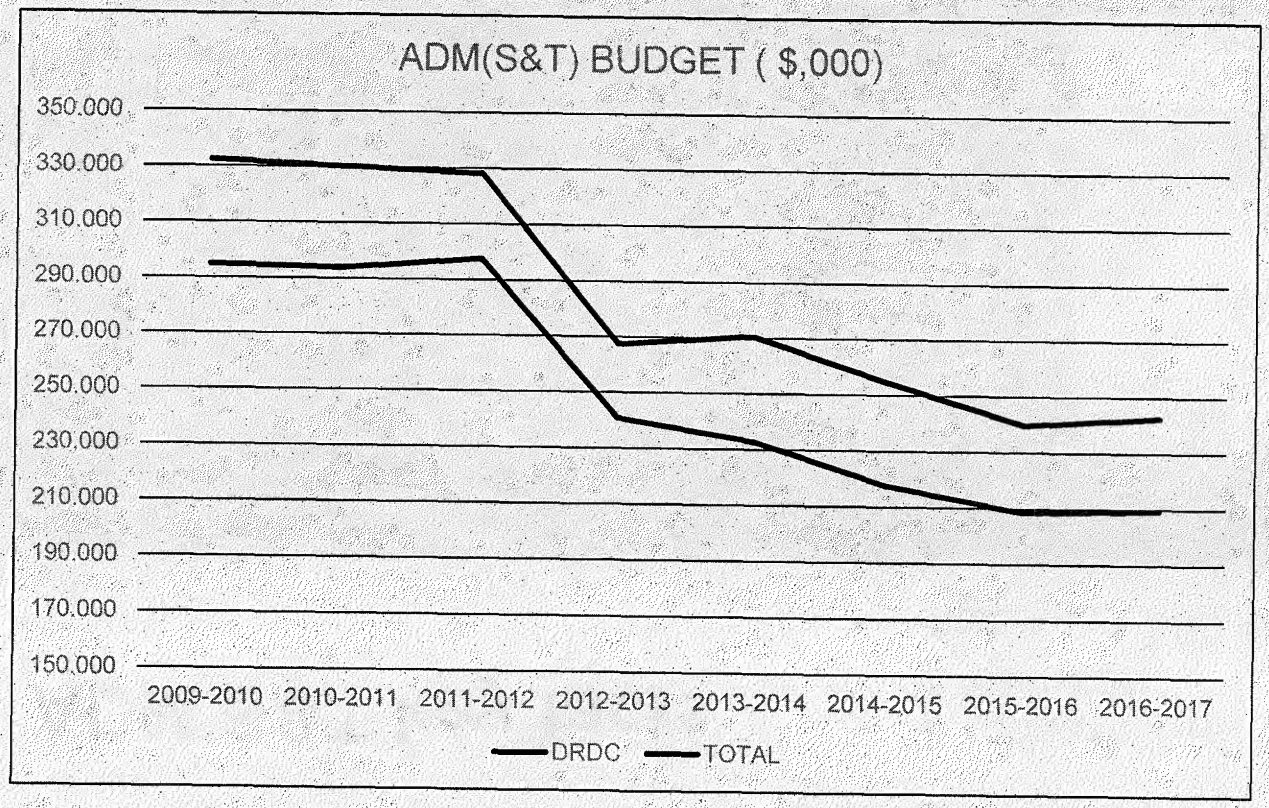
Therefore

Defence and security communities need to access these ideas at their inception to stay ahead.

Defence S&T represents approx 2.8% of Canadian S&T



Evolving resources....



FTE evolution

2011 – 1767 FTES
2016 – 1364 FTEs

ADM S&T key facts

- 8 research centres located in 4 provinces
- Approx 1,300 employees

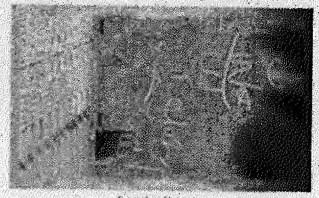
National Partnerships

OGD MOUs

- National Research Council
- Canadian Space Agency
- Natural Resources Canada
- Communications Research Canada
- Environment Canada

Partnership Programs

- Defence Innovation Research Program (DIRP)
- DND-NSERC Research Partnership Program
- Canadian Safety and Security Program



http://www.drdc-rddc.gc.ca/en/partnerships.page

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International Engagements

Multi-Lateral Programs

The Technical Cooperation Program (TTCP) (*AS, CA, NZ, UK, US*)

NATO Science and Technology Organization (NATO STO)

CBR MOU (*AS, CA, UK, US*)

CA- Trilateral MOU

Classified MOUs

4 Points -

RDT&E MOU - pending

Bi-Lateral Programs

CA– Defence S&T Bilaterals & Security MOUs (TSWG & CT)

CA- Defence S&T Bilateral

CA- Defence & Security S&T Bilateral

CA- Defence S&T Bilateral

CA Defence S&T Bilateral

CA- Defence S&T Bilateral

CA Defence S&T Bilateral

S&T organization

THE TECHNICAL COOPERATION PROGRAM TTCP

Knowledge is our currency

Mission
Provide a science, technology and knowledge advantage for Canada's defence and security

Vision
DRDC is a national leader and an international partner in S&T critical to Canada's defence and security

Roles

- Delivers knowledge, analysis and advice based on science and technology
- Recruits new ideas, knowledge and solutions by engaging with national and international partners
- Performs research and development in classified, sensitive and strategic areas
- A well managed research organization that promotes a respectful and inclusive workplace

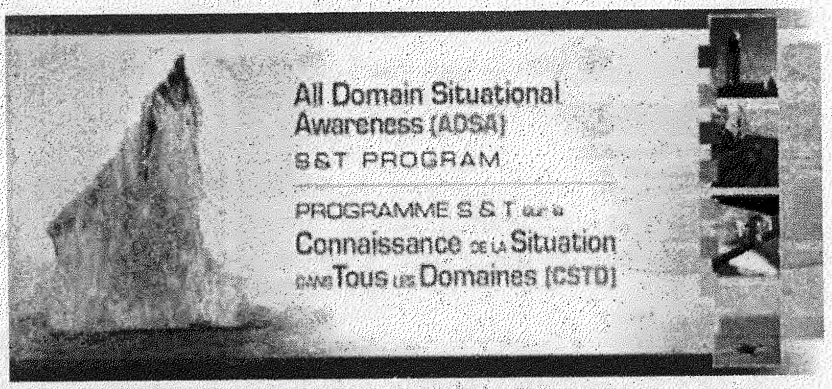
Impacts

- Build agile and adaptable forces to carry out missions across a wide spectrum of operations
- Assist and support CAF and civilian personnel before, during and after operations
- Enable the acquisition, sharing and use of critical information in support of situational awareness and decision-making
- Develop and implement solutions to maximize the affordability and sustainability of DND and the CAF
- Support public safety and security practitioners in their mission to protect Canadians
- Anticipate, prepare for and counter the emergence of future threats

S&T HIGHLIGHTS

All Domain Situational Awareness

ADSA is a $133M, 5 year program launched in 2015/2016



- The objective is to deliver assessments and advice on the performance and viability of existing and future concepts, technologies and methodologies that could contribute to improved awareness across air, maritime surface and sub-surface domains
- The concepts and technology solutions to be considered for the Arctic must be suitable to a remote setting subject to limited power sources, limited access and re-supply, harsh weather, limited communications and vulnerability to capture.

The Innovation Imperative

WHY WE MUST INNOVATE

- Nature of conflicts and threats is rapidly evolving and changing as new technologies, players and domains emerge;
- Current suite of S&T defence and security programs and investments is inadequate to address these changes ("innovation deficit");
- Must innovate to maintain defence capabilities that address current and emerging challenges; to stay ahead of rapidly evolving technology and foes; and inform future decisions; and
- Must innovate to remain economically competitive.

HOW WE CAN INNOVATE

- **Recruit innovators** to be partners in the delivery of S&T for defence and security;
- Develop a technologically advanced and **innovation-driven defence and security sector** capable of addressing evolving threats;
- Focus on partnerships and collaboration to foster and **leverage emerging S&T** developed across the innovation ecosystem; and
- **Leverage the buying power of government** to target sectors that have the most innovative solutions.

Aligning with Allies

- The **U.S.** has launched its *Third Offset Strategy* (U.S. $3.6 billion) aimed at leapfrogging the conventional R&D process by tapping into civilian efforts and improving collaboration with innovative private sector enterprises. The US DoD has requested a budget of US$71.8 billion for R&D in 2017.

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IDeS program drivers

Expected outcomes:

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Key features:

- Simple, coherent and agile processes
- Demand driven: Competitions and projects are driven by the challenges identified by DND and security partners
- Bring new products into the hands of defence and security

A new innovation paradigm is required due to maintain the technological advantage of the DND/CAF and security stakeholders.

We will innovate by…

- Recruiting innovators
- Supporting innovative idea
- Accelerating deployment of ideas into product

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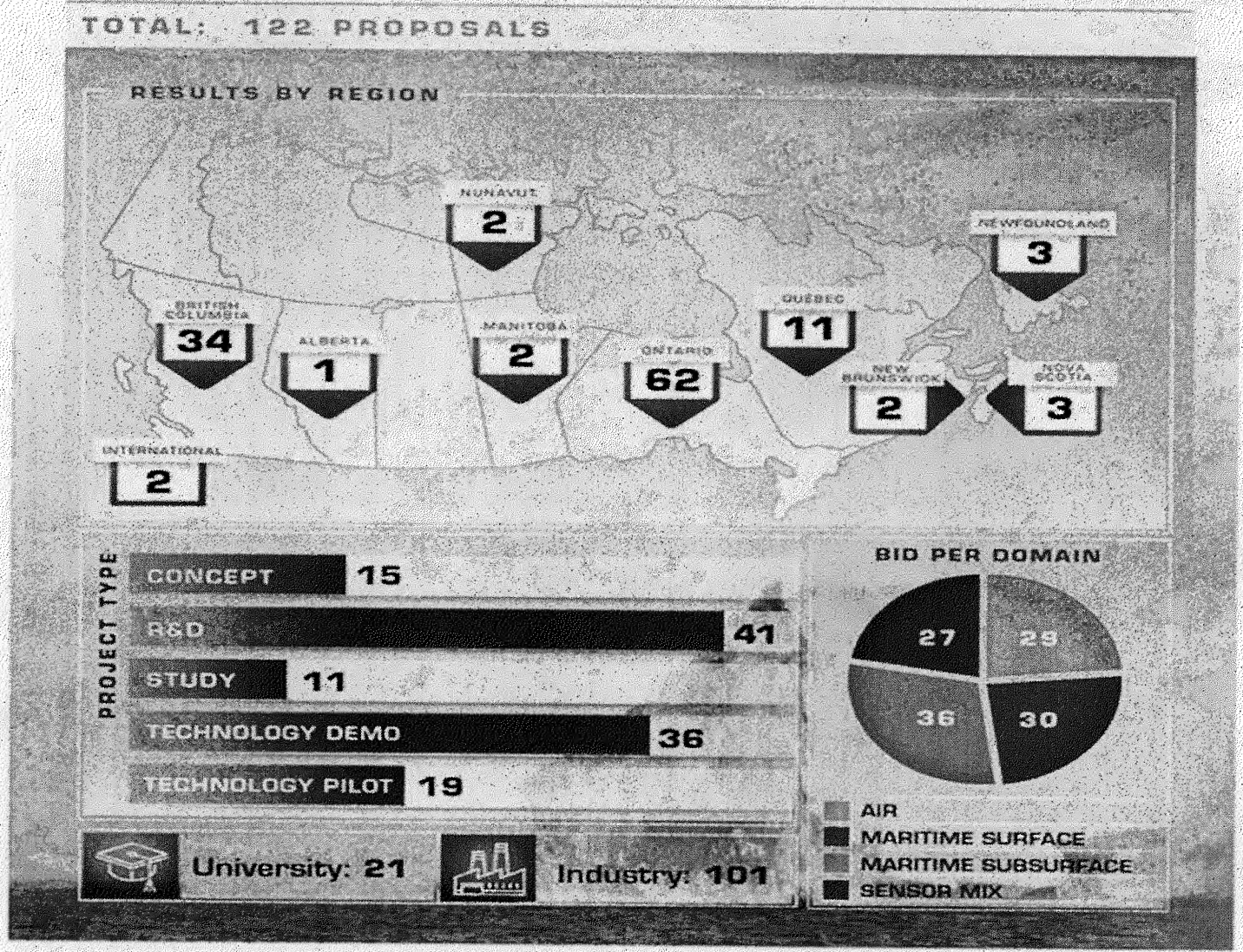

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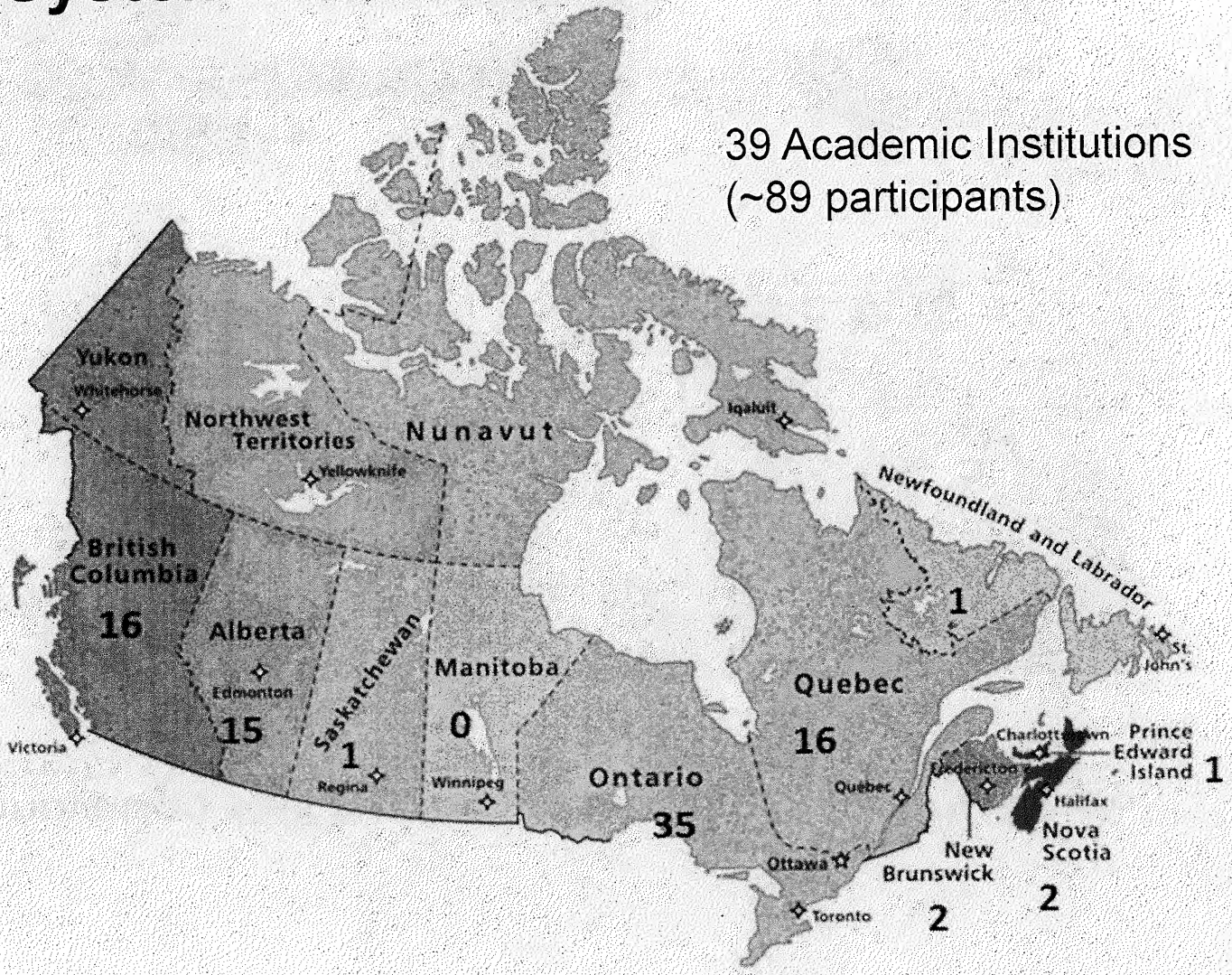

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  - Technology Innovation Fund (TIF) – app. $6-7M
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- Programs to be leveraged :
  - Canadian Safety and Security Program
  - Defence Innovation Research Program
  - All Domain Situational Awareness

The S&T program

- Is driven by requirements
  - Which the DGs of programs prioritize with the CAF
- And adds new S&T that will have an impact on future capabilities
  - Which staff contributes to the programming intake
- And focuses on what other S&T and knowledge providers can not do
- To generate trusted advice and solutions with a defence and security added value.